

Page 1, line 11, change "video signal" to --audio--.

Page 1, line 16, change "commercial imagery and video" to --audio--.

Page 1, line 18, change "visual/video" to --audio--.

Page 1, lines 24-25, change "brightness levels of the visible portion of a video" to --an audio--.

In the Claims:

Delete the claims submitted with the specification, and substitute therefor the following claims:

26. Apparatus comprising:
a source of data corresponding to an audio signal;
a detection system for generating a control signal from multi-bit auxiliary data embedded within the audio signal, said embedded auxiliary data being substantially imperceptible to a human listener of said audio signal; and
means responsive to said control signal for inhibiting copying of said audio signal.

27. A method of embedding multi-bit auxiliary data into an input audio signal that is thereafter compressed to yield a compressed signal, and thereafter discerning the multi-bit auxiliary data from a non-identical counterpart to said audio signal obtained by decompressing the compressed signal, the method comprising:

providing an input audio signal representing a plurality of sequential series of audio data, each series comprising a plurality of samples, each sample having a value associated therewith;

for each of a plurality of samples in a series, transforming the value thereof in accordance with at least some of said multi-bit auxiliary data, wherein an encoded series of audio data is produced having the complete auxiliary data embedded therein;

repeating the foregoing step for a plurality of different series of said audio signal, thereby yielding a first encoded audio signal in which the auxiliary data is redundantly encoded through different temporal excerpts thereof;

compressing the first encoded audio signal;

decompressing the compressed, first encoded audio signal to produce a second encoded audio signal, said second encoded audio signal being non-identical to the first due to said compression/ decompression process; and

discerning the multi-bit auxiliary data from the second encoded audio signal without reference to the input audio signal.

28. The method of claim 27 in which the discerning step includes processing a plurality of series of said second encoded audio signal to determine the auxiliary multi-bit data embedded therein, wherein greater or lesser confidence in the auxiliary multi-bit data discerned from said second encoded audio signal can be obtained by processing more or less series, respectively.

29. The method of claim 28 which includes performing said processing by a hardware decoding circuit.

30. The method of claim 29 which includes disabling recording capability of an apparatus based on said discerned auxiliary multi-bit data.

31. The method of claim 29 which includes incrementing a program specific billing meter based on said discerned auxiliary multi-bit data.

32. The method of claim 27 which includes:

after the compressing step, storing said compressed, first encoded audio signal on an optically encoded storage disk; and

prior to said decoding step, reading said compressed, first encoded audio signal from said optically encoded storage disk.

33. The method of claim 27 which includes converting the second encoded audio signal to analog form, and thereafter discerning the multi-bit auxiliary data therefrom.

34. The method of claim 33 which includes digitizing the analog form of the second encoded audio signal to produce a digitized signal, and discerning the multi-bit auxiliary data from said digitized signal.

35. The method of claim 27 in which all of said steps occur in the time domain, rather than some occurring in a transformed, frequency domain.

36. The method of claim 27 in which the transforming step includes also processing the value of said plurality of samples in accordance with samples of a pseudo-random noise signal.

37. The method of claim 27 wherein a plurality of samples in the first encoded audio signal are each encoded in accordance with more than one bit of said auxiliary data signal, wherein single samples are each encoded in accordance with multiple bits.

38. The method of claim 27 wherein a plurality of samples in the first encoded audio signal are each encoded in accordance with no more than one bit of said auxiliary data signal, wherein signal samples are each encoded in accordance with single bits.

39. A method of decoding an encoded audio signal to extract a multi-bit auxiliary data signal therefrom, the encoded audio signal comprising plural sequential series of audio data, each series comprising a plurality of samples, each sample having a value associated therewith,

the multi-bit auxiliary data signal being steganographically encoded in each of several of the series, the multi-bit auxiliary data signal being generally imperceptible to human listeners of the encoded audio signal, said encoding taking the form of slight changes to portions of said audio signal to thereby represent said multi-bit auxiliary data signal, the method further including:

computing parameters related to the entropies of first and second signals, the first of said signals being an altered version of said encoded audio signal; and

comparing said computed parameters to discern the value of at least one bit of said multi-bit auxiliary data signal.

40. The method of claim 39 in which the second of said signals is the encoded audio signal.

41. A method of decoding an encoded audio signal to extract a multi-bit auxiliary data signal therefrom, the encoded audio signal comprising plural sequential series of audio data, each series comprising a plurality of samples, each sample having a value associated therewith, the multi-bit auxiliary data signal being steganographically encoded in each of several of the series, the multi-bit auxiliary data signal being generally imperceptible to human listeners of the encoded audio signal, said encoding taking the form of slight changes to portions of said audio signal to thereby represent said multi-bit auxiliary data signal, the method further including processing encoded audio signal corresponding to a plurality of series to extract said multi-bit auxiliary data signal therefrom, wherein greater or lesser confidence in the extracted multi-bit auxiliary data signal can be obtained by processing more or less series of the encoded audio signal, respectively.

42. The method of claim 41 in which said decoding includes statistically analyzing the encoded audio signal to discern the auxiliary data signal encoded therein.

43. The method of claim 41 which further includes disabling a recording capability of an associated apparatus based on said extracted auxiliary data signal.

44. The method of claim 41 which includes reading said encoded audio signal from an optically encoded storage disk on which it was stored in lossy compressed form, and decompressing same prior to said decoding.

45. The method of claim 44 which includes converting said audio signal to analog form prior to said decoding.

46. The method of claim 41 in which said decoding is accomplished in the time domain.

47. A method of decoding an encoded audio signal to extract a multi-bit auxiliary data signal therefrom, the encoded audio signal comprising plural sequential series of audio data, each series comprising a plurality of samples, each sample having a value associated therewith, the multi-bit auxiliary data signal being steganographically encoded in each of several of the series, the multi-bit auxiliary data signal being generally imperceptible to human listeners of the encoded audio signal, said encoding taking the form of slight changes to portions of said audio signal to thereby represent said multi-bit auxiliary data signal, the method further including computing a dot product between a representation of the encoded audio and reference data for each of several different series, combining these dot products, comparing the outcome of said combined dot product computations with a threshold, and discerning the value of at least a part of said multi-bit auxiliary data based on said comparison.

48. A method of decoding an encoded audio signal to extract a multi-bit auxiliary data signal therefrom, the encoded audio signal comprising plural sequential series of audio data, each series comprising a plurality of samples, each sample having a value associated therewith, the

multi-bit auxiliary data signal being steganographically encoded in each of several of the series, the multi-bit auxiliary data signal being generally imperceptible to human listeners of the encoded audio signal, said encoding taking the form of slight changes to portions of said audio signal to thereby represent said multi-bit auxiliary data signal, the method further including processing the encoded audio signal with a pseudo-random key signal to de-randomize the multi-bit auxiliary data signal steganographically encoded therein.

49. The method of claim 48 which includes evaluating whether copying of the encoded audio signal is permitted, based on the decoded auxiliary data signal.

50. A method of decoding an encoded audio signal to extract a multi-bit auxiliary data signal therefrom, the encoded audio signal comprising plural sequential series of audio data, each series comprising a plurality of samples, each sample having a value associated therewith, the multi-bit auxiliary data signal being steganographically encoded in each of several of the series, the multi-bit auxiliary data signal being generally imperceptible to human listeners of the encoded audio signal, said encoding taking the form of slight changes to portions of said audio signal to thereby represent said multi-bit auxiliary data signal, the method further including applying the encoded audio signal to a matched filter processing unit, applying a reference signal to said matched filter processing unit, and processing a plurality of series of said encoded audio signal with said processing unit to extract the multi-bit auxiliary data signal therefrom.

51. The method of claim 47 in which the decoding includes processing a plurality of series of said audio data to extract the auxiliary multi-bit data encoded therein, wherein greater or lesser confidence in the auxiliary multi-bit data is obtained by processing more or less series, respectively.

52. The method of claim 51 which further includes disabling recording capability of an associated audio apparatus based on said extracted auxiliary data.

53. The method of claim 47 in which said decoding includes statistically analyzing the encoded audio to discern the auxiliary data encoded therein.

54. The method of claim 47 which further includes disabling recording capability of an associated audio apparatus based on said extracted auxiliary data.

55. The method of claim 54 which further includes disabling recording capability of the associated audio apparatus based on part of said extracted auxiliary data, other of said extracted auxiliary data serving a purpose unrelated to disabling a recording capability.

56. The method of claim 47 which includes reading said encoded audio from an optically encoded storage disk prior to said decoding.

57. The method of claim 56 in which said encoded audio is stored on the optically encoded storage disk in a compressed form that leads to data loss from the encoded audio.

58. The method of claim 57 which further includes disabling recording capability of an associated audio apparatus based on the auxiliary data extracted from said encoded audio notwithstanding said data loss.

59. The method of claim 47 in which said decoding is accomplished in the time domain.

60. The method of claim 47 which further includes processing the encoded audio with a pseudo-random key signal in decoding the multi-bit auxiliary data steganographically encoded therein.

61. The method of claim 60 which includes evaluating whether copying of the encoded audio is permitted, based on the decoded auxiliary data.

62. The method of claim 47 in which said dot product computations are performed by a matched filter processing unit.

63. The method of claim 62 which includes processing plural series of said encoded audio with said processing unit to extract the multi-bit auxiliary data therefrom.

64. The method of claim 47 in which said decoding does not yield a final multi-bit auxiliary data until plural series have been processed.

65. A method of decoding an encoded audio signal to extract a multi-bit auxiliary data signal therefrom, the encoded audio signal comprising plural sequential series of audio data, each series comprising a plurality of samples, each sample having a value associated therewith, the multi-bit auxiliary data signal being steganographically encoded in each of several of the series, the multi-bit auxiliary data signal being generally imperceptible to human listeners of the encoded audio signal, said encoding taking the form of slight changes to portions of said audio signal to thereby represent said multi-bit auxiliary data signal, the method further including, for a first series, performing one or more dot product operations between a representation of said series and reference data, repeating said dot product operations for each of one or more additional series, combining the dot products thus produced, discerning at least part of the multi-bit auxiliary data from said combined dot products, and determining whether to disable recording capability of an associated audio apparatus based on said discerned data.